

IN THE CLAIMS

1 1. [currently amended] Method for monitoring of a communication link between a
2 source network node and a destination network node, comprising
3 - employing, on said communication link, the IPSec protocol for tunneling IP
4 packets between the source network node and the destination network node,
5 - transmitting an acknowledgement packet by the destination network node ~~if at~~
6 least when a second condition ~~one~~ of a first condition and a second condition is
7 fulfilled, said first condition being the reception of at least a predetermined number
8 of IPSec packets after transmission of the previous acknowledgement packet,
9 and said second condition being the reception of an IPSec packet via the
10 communication link after a predetermined time has passed after transmission of
11 the previous acknowledgement packet.

1 2. [currently amended] Method for monitoring of a communication link between a
2 source network node and a destination network node, comprising
3 - employing, on said communication link, the IPSec protocol for tunneling
4 IP packets between the source network node and the destination network node,
5 - transmitting an acknowledgement packet by the destination network
6 node ~~if at~~ least when a second condition ~~one~~ of a first condition and a second
7 condition is fulfilled, wherein said acknowledgement packet comprises at least the
8 sequence number of the last received IPSec packet and at least one value
9 corresponding to the amount of data received via the IPSec communication link,
10 said first condition being the reception of at least a predetermined number of
11 IPSec packets after transmission of the previous acknowledgement packet, and
12 said second condition being the reception of a packet via the communication link
13 after a predetermined time has passed after transmission of the previous
14 acknowledgement packet.

1 3. [original] A method according to claim 2, wherein said acknowledgement packet
2 comprises at least a packet counter value indicating the number of packets received via
3 the communication link.

1 4. [original] A method according to claim 2, wherein said acknowledgement packet
2 comprises at least a byte counter value indicating the number of bytes received via the
3 communication link.

1 5. [original] A method according to claim 2, wherein said acknowledgement packet
2 comprises at least a packet counter value indicating the number of packets received via
3 the communication link and a byte counter value indicating the number of bytes received
4 via the communication link.

1 6. [original] A method according to claim 2, further comprising at least the step of
2 determining the packet success rate of the communication link at least partly on the basis
3 of information contained in an acknowledgement packet.

1 7. [original] A method according to claim 2, further comprising at least the step of
2 determining the throughput of the communication link at least partly on the basis of
3 information contained in an acknowledgement packet.

1 8. [currently amended] A method for measuring the performance of an IPSEC ~~monitoring~~
2 of a communication link between a source network node and a destination network node,
3 comprising

4 - employing, on said communication link, the IPsec protocol for tunneling IP
5 packets between the source network node and the destination network node,
6 - transmitting an acknowledgement packet by the destination network node
7 if at least when a second condition ~~one~~ of a first condition and a second
8 condition is fulfilled,

9 said first condition being the reception of at least a predetermined
10 number of IPsec packets after transmission of the previous
11 acknowledgement packet, and
12 said second condition being the reception of an IPsec packet via the
13 communication link after a predetermined time has passed after
14 transmission of the previous acknowledgement packet

15 - storing of the sequence number and the transmission time of each IPsec
16 packet transmitted from the source network node to the destination network

17 node in a memory means, and
 18 - determining the round trip time of the communication link on the basis of
 19 the reception time of an acknowledgement packet and the stored transmission
 20 time of the corresponding transmitted packet.

1 9. [currently amended] Method for monitoring of a plurality of communication links
 2 between a source network site and a destination network site, each of the sites having
 3 at least one network node,
 4 in which method an active communication link is monitored and an inactive communication
 5 link is monitored,
 6 said method comprising at least the following steps for monitoring an active
 7 communication link between the source network site and the destination network site, the
 8 active communication link employing the IPSec protocol:

9 the step of transmission of an acknowledgement packet by the destination
 10 network node ~~if at least~~ when a second condition ~~one of~~ a first condition and a
 11 second condition is fulfilled,

12 said first condition being the reception of at least a predetermined number
 13 of IPSec packets after transmission of the previous acknowledgement
 14 packet, and

15 said second condition being the reception of a packet via the
 16 communication link after a predetermined time has passed after transmission
 17 of the previous acknowledgement packet,

18 and said method comprising at least the following steps for monitoring an inactive
 19 communication link between the source network site and the destination network site:

20 - transmitting a probe packet from a source node at the source network site
 21 via said inactive communication link to a destination node at the destination
 22 network site,

23 - storing the transmission time of said probe packet in a memory means,

24 - transmitting a response packet from said destination node to said source
 25 node as a response to receiving a probe packet,

26 - determining the round trip time of said inactive communication link from the
 27 difference of the reception time of the response packet and the stored
 28 transmission time of the corresponding probe packet

29 - maintaining present status of said active and inactive communications links
30 or replacing said active communication link with said inactive communication link
31 based on results of said monitoring.

1 10. [original] A method according to claim 9, said method further comprising the steps
2 of

- 3 - transmitting a plurality of probe packets from said source node at the
- 4 source network site via said inactive communication link to said destination node
- 5 at the destination network site,
- 6 - receiving response packets to said probe packets, and
- 7 - determining the packet success rate of said inactive communication link
- 8 from the number of said received response packets and the number of
- 9 transmitted probe packets.

1 11. [currently amended] A network node comprising at least

- 2 - means for communicating over a IPSec protocol communication link
- 3 with a second network node in order to tunnel IP packets transmitted to said
- 4 second network node,
- 5 - means for sending IPSec packets containing IP packets,
- 6 - means for receiving acknowledgement packets for said IPSec
- 7 packets,
- 8 - means for obtaining a sequence number of an IPSec packet from a
- 9 received acknowledgement packet,
- 10 - means for obtaining a value from the acknowledgement packet, said
- 11 value corresponding to the amount of data received via the communication
- 12 link by the second network node, and
- 13 - means for determining the packet success rate of the communication
- 14 link at least partly on the basis of said value.

1 12. [original] A network node according to claim 11, further comprising at least means
2 determining the throughput of the communication link at least partly on the basis of said
3 value.

1 13. [currently amended] A network node comprising at least

2 - means for communicating over a IPSec protocol communication link
3 with a second network node in order to tunnel IP packets transmitted to said
4 second network node,

5 - means for sending IPSec packets containing IP packets,

6 - means for receiving acknowledgement packets for said IPSec
7 packets,

8 - means for obtaining a sequence number of an IPSec packet from a
9 received acknowledgement packet,

10 - means for storing in a memory means the sequence number and the
11 transmission time of each IPSec packet transmitted by the network node via
12 the communication link, and

13 - means for determining the round trip time of the communication link
14 on the basis of the reception time of an acknowledgement packet and the
15 stored transmission time of the corresponding transmitted packet.

1 14. [currently amended] A network node comprising at least

2 - means for communicating over a IPSec protocol communication link
3 with a second network node in order to tunnel IP packets transmitted from
4 said second network node,

5 - means for sending IPSec packets containing IP packets,

6 - means for transmitting an acknowledgement packet ~~if~~ at least when
7 a second condition ~~one of~~ a first condition and a second condition is fulfilled,
8 said first condition being the reception of at least a predetermined number
9 of IPSec packets after transmission of the previous acknowledgement
10 packet, and
11 said second condition being the reception of a packet via the
12 communication link after a predetermined time has passed after
13 transmission of the previous acknowledgement packet.

1 15. [currently amended] A network node comprising at least

2 - means for communicating over a IPSec protocol communication link
3 with a second network node in order to tunnel IP packets transmitted from

said second network node,
 - means for receiving IPSec packets containing IP packets,
 - means for transmitting an acknowledgement packet ~~if~~ at least when
a second condition ~~one~~ of a first condition and a second condition is fulfilled,-
 - means for inserting a sequence number of a received IPSec packet
 and at least one value corresponding to the amount of data received via the
 communication link in said acknowledgement packet,
 said first condition being the reception of at least a predetermined
 number of IPSec packets after transmission of the previous
 acknowledgement packet, and
 said second condition being the reception of a packet via the
 communication link after a predetermined time has passed after transmission
 of the previous acknowledgement packet.

16. [previously amended] A network node according to claim 15, said network node
 further comprising at least means inserting a packet counter value in said
 acknowledgement packet, said packet counter value indicating the number of packets
 received via the communication link.

17. [previously amended] A network node according to claim 15, said network node
 further comprising at least means inserting a byte counter value in said
 acknowledgement packet, said byte counter value indicating the number of bytes
 received via the communication link.

18. [currently amended] A network node comprising at least
 - means for communicating over a IPSec protocol communication link
 with a second network node in order to tunnel IP packets transmitted from
 said second network node,
 - means for transmitting an acknowledgement packet ~~if~~ at least when
a second condition ~~one~~ of a first condition and a second condition is fulfilled,
 said first condition being the reception of at least a predetermined number
 of IPSec packets after transmission of the previous acknowledgement
 packet, and

10 said second condition being the reception of a packet via the
 11 communication link after a predetermined time has passed after
 12 transmission of the previous acknowledgement packet,
 13 - means for sending IPSec packets,
 14 - means for receiving acknowledgement packets for said IPSec packets,
 15 - means for obtaining a sequence number of an IPSec packet from a
 16 received acknowledgement packet,
 17 - means for obtaining a value from the acknowledgement packet, said value
 18 corresponding to the amount of data received via the communication link by the
 19 second network node, and
 20 - means for determining the packet success rate of the communication link
 21 at least partly on the basis of said value.

1 19. [currently amended] Software program product comprising a computer readable
 2 medium containing computer-readable software program code for a network node for
 3 controlling said network node to communicate using ~~communicating with~~ the IPSec
 4 protocol with a second network node via a communication link, said software program
 5 product code comprising at least
 6 - software program code for communicating over a IPSec protocol
 7 communication link with a second network node in order to tunnel IP packets
 8 transmitted from said second network node,
 9 - software program code for receiving IPSec packets containing IP
 10 packets,
 11 - software program code for transmitting an acknowledgement packet
 12 if at least when a second condition ~~one of~~ a first condition and a second
 13 condition is fulfilled,
 14 said first condition being the reception of at least a predetermined number
 15 of IPSec packets after transmission of the previous acknowledgement
 16 packet, and
 17 said second condition being the reception of a packet via the
 18 communication link after a predetermined time has passed after
 19 transmission of the previous acknowledgement packet,
 20 - software program code for receiving acknowledgement packets for

21 IPSec packets transmitted by the network node,
 22 - software program code for obtaining a sequence number of an IPSec
 23 packet from a received acknowledgement packet,
 24 - software program code for obtaining a value from the
 25 acknowledgement packet, said value corresponding to the amount of data
 26 received via the communication link by the second network node, and
 27 - software program code for determining the packet success rate of the
 28 communication link at least partly on the basis of said value.

1 20. [currently amended] Software program product comprising a computer
 2 readable medium containing computer-readable software program code for a network
 3 node for controlling said network node to communicate using ~~communicating with~~ the
 4 IPSec protocol with a second network node via a communication link, said software
 5 program ~~code product~~ comprising at least
 6 - software program code for communicating over a IPSec protocol
 7 communication link with a second network node in order to tunnel IP packets
 8 transmitted to said second network node,
 9 - software program code for sending IPSec packets containing IP packets,
 10 - software program code for receiving acknowledgement packets for said
 11 IPSec packets,
 12 - software program code for obtaining a sequence number of an IPSec
 13 packet from a received acknowledgement packet,
 14 - software program code for storing in a memory means the sequence
 15 number and the transmission time of each IPSec packet transmitted by the
 16 network node via the communication link, and
 17 - software program code for determining the round trip time of the
 18 communication link on the basis of the reception time of an acknowledgement
 19 packet and the stored transmission time of the corresponding transmitted
 20 packet.

1 21. [allowed] Method for monitoring of a communication link between a source network
 2 node and a destination network node, comprising
 3 - employing, on said communication link, the IPSec protocol for tunneling IP

4 packets of one or more TCP/IP connections between the source network node
5 and the destination network node,

6 - transmitting, separately from TCP retransmission scheme carried out on
7 said one or more TCP/IP connections, an acknowledgement packet by the
8 destination network node if at least one of a first condition and a second
9 condition is fulfilled,

10 said first condition being the reception of at least a predetermined number
11 of IPSec packets after transmission of the previous acknowledgement
12 packet, and

13 said second condition being the reception of an IPSec packet via the
14 communication link after a predetermined time has passed after
15 transmission of the previous acknowledgement packet.

1 22. [allowed] A method according to claim 21, comprising tunneling IP packets of two or
2 more TCP/IP connections by means of said communication link using the IPSec protocol.